

RESEARCH ARTICLE

Potentially preventable visits to the emergency department in older adults: Results from a national survey in Italy

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Data Availability Statement: Data are from the Multipurpose Survey “Health conditions and use of health services”, edition 2012–2013. The data can be made available to interested and qualified researchers by contacting the Director of Central Direction of socio-demographic and environmental statistics at ISTAT (Istituto nazionale di statistica); tel. +39 06 4673.7251, email gargiulo@istat.it. Metadata are available at http://dati.istat.it/Index.aspx?DataSetCode=DCIS_RSERSVAN. Other interested researchers would be able to access these data in the same manner as the authors. the

Abstract

Background

Despite older adults use emergency department more appropriately than other age groups, there is a significant share of admissions that can be considered potentially preventable.

Objective

To identify socio-demographic characteristics and health care resources use of older adults admitted to emergency department for a potentially preventable visit.

Design

Data come from the Multipurpose Survey “Health conditions and use of health services”, edition 2012–2013. A stratified multi-stage probability design was used to select a sample using municipal lists of households.

Subject

50474 community dwelling Italians were interviewed. In this analysis, 27003 subjects aged 65 years or older were considered.

Methods

Potentially preventable visits were defined as an emergency department visit that did not result in inpatient admission. Independent variables were classified based on the socio-behavioral model of Andersen-Newman. Descriptive statistics and a logistic regression model were developed.

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Results

In the twelve months before the interview 3872 subjects (14.3%) had at least one potentially preventable visit. Factors associated with an increased risk of a potentially preventable visit were older age (75–84 years: OR 1.096, CI 1.001–1.199; 85+ years: OR 1.022, CI 1.071–1.391), at least one hospital admission (OR 3.869, CI 3.547–4.221), to waive a visit (OR 1.188, CI 1.017–1.389) or an exam (OR 1.300, CI 1.077–1.570). Factors associated with a lower risk were female gender (OR 0.893, CI 0.819–0.975), area of residence (Center: OR 0.850, CI 0.766–0.943; Islands: OR 0.617, CI 0.539–0.706, South: OR 0.560, CI 0.505–0.622), private paid assistance (OR 0.761, CI 0.602–0.962); a better health-related quality of life (PCS score 46–54: OR 0.744, CI 0.659–0.841; PCS score >55: OR 0.746, CI 0.644–0.865).

Conclusions

Our study identified several characteristics associated with an increased risk of potentially preventable visits to the emergency department. This might allow the development of specific interventions to prevent the access of at risk subjects to the emergency department.

Introduction

Older patients represent between 12% and 21% of the emergency department (ED) visits and this percentage is expected to increase in the coming decades [1], growing up to about 34% by 2030 [2]. Italian data indicate that older adults already exceed 30% of ED users [3,4]. Older adults have more serious illnesses than other age group on arrival in the ED, as measured by triage acuity, diagnostic work-up, and hospital admission rate, and are also more likely to try to contact their general practitioner or other non-urgent sources of medical care prior to arriving at the ED [5]. Despite this, over 20% of ED attendances are potentially preventable [6], with an increased risk of adverse consequences such as re-admission, hospitalization, mortality [7].

Several studies focused on the potentially preventable ED visit patterns by older adults, but only a few are population-based [5], and many studies are based on administrative data. The hospital administrative data provided a very limited insight other than medical diagnoses, considering that older people attend the ED for a range of reasons that are individual, societal and related to the health services system, as well as strictly clinical [8]. The absence of data on the source population precludes the evaluation of the role of risk factors such as environmental factors or other socio-structural constructs [5].

The aim of our study was to identify socio-demographic characteristics and health care resources use of population-based cohort of community-dwelling older adults admitted to the ED for a potentially preventable visit.

Materials and methods

Our data come from the Multipurpose Survey “Health conditions and use of health services”, edition 2012–2013. The methods have been previously described in detail [9–12]. In brief, the survey is part of the Italian system of the “Multipurpose Surveys on households” started in 1993 and is repeated every five years. The survey consists of a self-administered paper questionnaire and a face to face interview with paper questionnaire. The sample was selected from

the municipal lists of households, using a stratified multi-stage probability design. In the first stage, municipalities were the primary sampling units. The second stage of the sample design involved clustering households from municipality lists. The sampling unit was a household of persons living together, with legal, affective, or family relationships, with regard to the number of persons in the household. Exclusion criteria of the survey were: those household members who had died, residence outside of Italy or in a nursing home, non-existent address, and inability to localize or access the address. Total units selected were 60730 and respondents were 50474. For our analysis, we only considered respondents who were 65 or more years old.

Variables

Outcome variable was the occurrence of at least one potentially preventable visit to the ED in the twelve months before the interview. This information was available by means of a specific question in the interview: “Did you attend to the emergency department at least one time without an in-hospital admission in the last year?”

To our purpose, we considered the ED visits which did not result in inpatient admission as potentially preventable, according with Agency for Healthcare Research and Quality [13]. This definition has been previously employed in studies regarding ED use [14].

We selected independent variables from the entire survey questionnaire based on the socio-behavioral model of Andersen-Newman that has been extensively used in studies investigating the use of health services, including ED use [5, 15]. The explanatory factors of health care use are classified as predisposing factors, enabling factors, and needing factors [16].

We considered as predisposing factors age, gender, area of residence (North, Central, South and Islands), education (≤ 5 years, 6–8 years; 9–12 years; 13 or more), marital status (single, married, separated/divorced, widow), family composition (formed of a single, a couple with or without children, or a single -mother or father- with children).

Enabling factors included judgment about income (excellent, adequate, low, and insufficient). We also considered the co-payment of public health expenditure. In Italy a private contribute to public health expenditure might be requested depending on age, income and selected conditions such as severe disability or specific diseases (e.g. diabetes, hypertension, cancer). Subjects can be completely exempt, partially exempt or not exempt.

Needing factors included multimorbidity, number of drugs taken every day, disability and the individual health related quality of life (HRQoL). Multimorbidity was defined as the presence of three or more of chronic conditions. It was derived from a predefined list that included diabetes; myocardial infarction; angina pectoris; other diseases of the heart; stroke (ischemic or hemorrhagic); chronic obstructive pulmonary disease, emphysema; cirrhosis; malignant tumor (including lymphoma / leukemia); parkinsonism; dementia, renal failure. Drugs taken every day were considered. Three classes were defined: no drugs, 1–4 medicines every day, 5 or more medicines (polypharmacy).

Disability was assessed using a set of questions based on the International Classification of Impairments Disabilities and Handicaps (ICIDH) of the World Health Organization [17]. Specific disability categories were identified: physical disability (confinement/difficulty walking, lowering oneself, going up/going down, and brushing teeth), personal care (functional autonomy), communication impairment (sight, hearing, and speech), and self-restraint [18].

Health related quality of life was measured using the Short Form 12 with its components (Mental Component Summary, MCS, and Physical Component Summary, PCS), previously used in older adults [19].

In addition, we considered the health care resources use other than the ED. Health care resources included the number of general practitioner visits, specialist visits and in-hospital

admissions, and blood or urine tests and instrumental tests (i.e. X-ray, ultrasound, magnetic resonance, CT-scan, ECG). We considered the waive of an exam or a specialist visit for all reasons and for a too long waiting list. The use of a home care services (e.g. nurse and public or private assistants) was recorded. The presence of a private paid assistance was also recorded. A private paid assistance is a man or a woman (not a nurse) who gives help in the activity of daily living basic and instrumental. There isn't a municipality contribution for this help [20].

Statistical analysis

The frequency and the percentage or the mean and the standard deviation values were reported for all variables, as appropriate. The admission to the ED was considered a binary variable taking the value of 1 or 0, where 1 is a positive and 0 is a negative answer. For each descriptive variable, we tested if a statistical significant difference exists between the two groups; the χ^2 test was used. Non-categorical variables were compared using Student's T-test, or ANOVA, as appropriate.

In addition, a logistic regression model was performed to evaluate which covariates would better explain the factors associated with at least one potentially preventable visit. We created a training sample (24303 observations) and a holdout sample (2700 observations) based on the whole sample. The sample method used was a random extraction without repetition, fixing the dimension for the holdout sample equal to the 10% of the whole sample. The model was developed on the training sample and was then tested on the holdout sample. Moreover, we used the stepwise method to select the significant covariates. The selection process used the Wald χ^2 test, and the significant level to entry and to stay in the model were fixed at a probability equal to 0.25 and 0.05 respectively. We compared the results through ROC Curves, testing differences between the AUC. Furthermore, the Gini's Coefficient (Somers'D Index) and the Concordance Index were used to test the predictive capability of the model.

Analyses were performed using SAS version 9.3 (SAS Institute Inc).

Results

We considered 27003 subjects who were aged 65 years or older. Subjects who had at least one potentially preventable visit to ED in the previous twelve months were 3872 (14.3%). Characteristics of the total sample and of the subgroups with and without at least one potentially preventable visit are shown in [Table 1](#).

There were relevant differences regarding the area of residence, income, comorbidity, polypharmacy and disability. Furthermore, health-related quality of life was lower in ED users, both in the physical and in the mental components.

The use of health care services is summarized in [Table 2](#). About half of the subjects who had at least one clinical visit (by a specialist or a general practitioner), a diagnostic test or a blood exam attended the ED for a potentially preventable visit, while 30% of subjects who attended in ED were hospitalized at least once in the previous year. A private paid assistance was used by 7% of subjects. Among them, 27% had a potentially preventable visit to the ED. A higher percentage of potentially preventable visits was also recorded among subjects who waived a specialist visit or a diagnostic test. Among these subjects, approximately 20% had been waiting about 15 days, and 4% up to 61 days. Similarly, among those who had to give up a diagnostic test due to the long waiting list, about 24% went to the ED.

The stepwise logistic regression model ([Table 3](#)) showed that older age, to be widow or separated, the presence of comorbidity and polypharmacy increase the probability of having at least one potentially preventable visit. The use of health care services (diagnostic test, laboratory blood exams, a hospital admission in the previous year) and waiving for a visit or exam

Table 1. Descriptive analysis of the sample: Socio-behavioural model. Socio-demographic characteristics of the total sample and of the subgroups with and without at least one potentially preventable visit to the ED in the previous year.

	Potentially preventable visit			P
	Total sample N = 27003	None N = 23131	At least one N = 3872	
Predisposing factors				
Gender, F (n, %)	15336 (56.79)	13133 (56.77)	2203 (56.90)	0.890
Age (years) (n, %)				<0.001
65–74	13802 (51.11)	12137 (52.47)	1665 (43.00)	
75–84	9678 (35.84)	8122 (35.11)	1556 (40.19)	
85+	3523 (13.05)	2872 (12.41)	651 (16.81)	
Education (years) (n, %)				<0.001
None	3648 (13.51)	3077 (13.30)	571 (14.75)	
1–5	13118 (48.58)	11136 (48.19)	1982 (51.19)	
6–8	5005 (18.53)	4347 (18.79)	658 (16.99)	
9–13	3831 (14.19)	3342 (14.44)	489 (12.63)	
>13	1401 (5.19)	1229 (5.31)	172 (4.44)	
Marital status (n, %)				<0.001
Single	1831 (6.78)	1632 (7.05)	199 (5.14)	
Married	15510 (57.44)	13417 (58.00)	2093 (54.05)	
Separated/divorced	1092(4.04)	932 (4.02)	160(4.13)	
Widow/widower	8570 (31.74)	7150 (30.91)	1420 (36.67)	
Household (n, %)				<0.001
Single	9872 (36.55)	8166 (35.30)	1506 (38.89)	
Couple with children	3528 (13.06)	3078 (13.30)	450 (11.62)	
Couple without children	12189 (45.13)	10517 (45.46)	1672 (43.18)	
Single parent	1614 (5.97)	1370 (5.92)	244 (6.30)	
Area of residence (n, %)				<0.001
North	11867 (43.95)	9919 (42.88)	1948 (50.31)	
Center	5133 (19.011)	4366 (18.87)	767 (19.81)	
South	6911 (25.59)	6138 (26.53)	773 (19.96)	
Islands	3092 (11.45)	2708 (11.70)	384 (9.92)	
Enabling factors				
Self rated Income (n, %)				<0.001
Excellent	519 (1.92)	467 (2.01)	52 (1.34)	
Adequate	16196 (59.98)	13989 (60.47)	2207 (57.00)	
Low	9156 (33.91)	7746 (33.48)	1410 (36.42)	
Insufficient	1132 (4.19)	929 (4.01)	203 (5.24)	
Copayment to health care services (n, %)				<0.001
Completely exempt	6422 (23.78)	5829 (25.19)	593 (15.31)	
Partially exempt	14119 (52.29)	11781 (50.93)	2338 (60.38)	
not exempt	6462 (23.93)	5521 (23.86)	941 (24.30)	
Needing factors				
At least one chronic condition	12025 (44.53)	9656 (41.74)	2369 (61.18)	<0.001
Multimorbidity	11553 (42.78)	9621 (41.59)	2295(59.19)	<0.001
Drugs taken everyday (n,%)				<0.001
0 (n, %)	5032(18.63)	4680 (20.23)	352(9.09)	
1–4 (n, %)	15475 (57.31)	13483 (58.28)	1992 (51.44)	
5+ (n, %)	6496 (24.06)	4968 (21.47)	1528 (39.47)	
Disability				

(Continued)

Table 1. (Continued)

	Potentially preventable visit			P
	Total sample N = 27003	None N = 23131	At least one N = 3872	
Predisposing factors				
Any type(n, %)	5386 (19.95)	4195 (18.13)	1191 (30.75)	<0.001
Physical (n, %)	2756 (10.21)	2097 (9.06)	659 (17.01)	<0.001
Personal care (n, %)	3524 (13.05)	2676 (11.56)	848 (21.90)	<0.001
Communication impairment (n, %)	1408 (5.21)	1107 (4.78)	301 (7.77)	<0.001
Self restraint (n,%)	2568 (9.51)	1958(8.46)	610 (15.75)	<0.001
PCS (mean, SD)	42.6±11.89	51.9±11	37.8±12.1	<0.001
<32 (n, %)	6814(25.23)	5274(22.80)	1540(39.77)	<0.001
32–45 (n, %)	6978(25.84)	5870(25.37)	1108(28.61)	
46–54 (n, %)	7617(28.20)	6842(29.57)	775(20.01)	
≥55 (n, %)	5594(20.71)	5145(22.24)	449(11.59)	
MCS (mean, SD)	46.81+10.8	49.8±11.3	43.9±11.8	<0.001
<40 (n, %)	7081(26.22)	5620(24.29)	1461(37.73)	<0.001
40–49 (n, %)	6501(24.07)	5613(24.26)	888 (22.93)	
50-55(n, %)	7160(26.51)	6343(27.42)	817(21.10)	
56+ (n, %)	6261(23.18)	5555(24.01)	706(18.23)	

SD = standard deviation; PCS = Physical Component Summary; MCS = Mental Component Summary

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also increase the probability of admission to emergency services. On the other hand, factors associated with a lower probability to have a potentially preventable visit are female gender, living in the South of Italy or in the Islands, having a private paid assistance, and a better health related quality of life.

Table 2. Descriptive analysis of the sample: Health care resources use. Health care resources use of the total sample and of subgroups with and without at least a potentially preventable visit in ED in the previous year.

	Potentially preventable visit			p
	Total sample N = 27003	None N = 23131	At least one N = 3872	
At least one clinical visit in the last 4 weeks (n, %)	13651(50.55)	11140 (48.16)	2511(64.85)	
General practitioner visit in the last 4 weeks (n, %)	10347(38.31)	8471(36.62)	1876(48.45)	<0.001
In the last 12 months				
Visits by a specialist (n, %)	17791(65.88)	14552(62.91)	3239(83.65)	<0.001
Blood exams (n, %)	20017(74.10)	16626 (71.87)	3391(87.57)	<0.001
Instrumental tests (n, %)	13418(49.69)	10545 (45.58)	2873(74.19)	<0.001
Hospital admissions				
Previous three months(n, %)	1516(5.61)	900 (3.89)	616(15.90)	
Previous twelve months(n, %)	4097(15.17)	2486(10.74)	1161 (29.98)	
Home care (n, %)	1915(7.09)	1382(5.97)	533 (13.76)	<0.001
Private paid assistance (n, %)	1186 (4.39)	779(3.36)	257(6.63)	
To waive a visit (n, %)	2240(8.29)	1178(5.09)	462(11.93)	<0.001
waiting list too long (n, %)	864(3.19)	691(2.98)	173(4.46)	<0.001
To waive an exam (n, %)	1395(5.16)	1090(4.71)	305(7.87)	<0.001
Waiting list too long (n, %)	567(2.09)	432 (1.86)	135(3.48)	<0.001

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Table 3. Stepwise logistic regression analysis. Stepwise logistic regression analysis of the variables associated with at least one potentially preventable visit in emergency department in the previous 12 months.

Variable	OR	IC 95%
Gender (female)	0.893	0.819–0.975
Age (years)		
65–74	1	
75–84	1.096	1.001–1.199
85+	1.022	1.071–1.391
Area of residence		
North	1	
Center	0.850	0.766–0.943
South	0.560	0.505–0.622
Islands	0.617	0.539–0.706
Marital status		
Single	1	
Married	1.216	1.020–1.449
Separated/divorced	1.293	1.002–1.667
Widow	1.312	1.095–1.573
Co-payment to health care services		
Completely exempt	1	
Partially exempt	1.217	1.089–1.359
not exempt	1.065	0.940–1.207
At least one chronic condition	1.209	1.102–1.326
Drugs taken everyday		
0	1	
1–4	1.185	1.034–1.357
5+	1.445	1.239–1.684
At least one clinical visit	1.158	1.063–1.261
In the last 12 months		
Visits by a specialist	1.265	1.130–1.417
Blood exams	1.225	1.086–1.382
Diagnostic tests	2.005	1.821–2.207
Hospital admissions (previous year)	3.869	3.547–4.221
Home care	1.367	1.144–1.633
Private paid assistance	0.761	0.602–0.962
To waive a visit	1.188	1.017–1.389
To waive an exam	1.300	1.077–1.570
PCS		
<32	1	
32–45	0.928	0.836–1.030
46–54	0.744	0.659–0.841
55+	0.746	0.644–0.865

Variables excluded from the stepwise analysis: educational level, MCS score

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The ROC Curves built on the training and holdout sample show good AUC values (respectively equal to 0.7659 and 0.7509); the Gini Index (0.532) shows as well the adequacy of the model.

To understand the role of gender in determining the risk to attend ED, we carried out a secondary analysis comparing some characteristics of men and women in the whole sample. Compared with men, women made more often one or more medical visits in the previous

four weeks (51.7% vs 48.9%, respectively, $p < 0.001$), also for a clinical health check (14.5% vs 13.5, respectively, $p < 0.001$), and specialist visits (50.6% vs. 48.5%, $p = 0.007$). Women were more disabled than men (24.4% vs 14.2%, $p < 0.001$), particularly in mobility (12.8% vs. 6.9%, $p < 0.001$), in individual confinement (12.2% vs. 5.9%, $p < 0.001$) and in the activities of daily living (16.3% vs. 8.8%, $p < 0.001$), and had more often multimorbidity (50.4% against 32.8% of men, $p < 0.001$). Moreover, they suffered from different types of chronic conditions: the most prevalent diseases in women were Alzheimer's disease (5.4% versus 2.7% in men, $p < 0.001$) and hypertension (56.1% vs 50.5%, $p < 0.001$), while men are more often affected by diabetes mellitus (18.1% vs 16.8%, $p = 0.0062$), myocardial infarction (9.5% vs 3.9%, $p < 0.001$); chronic obstructive pulmonary disease (13.7% vs 9.7%, $p < 0.001$).

Discussion

Our study examined the characteristics of the Italian community-dwelling older adults who experienced a potentially preventable ED visit. Subjects who had at least one visit were older, widow or separated, lived more often in Northern Italy. These subjects were disabled, had a higher number of chronic diseases, and a worse perception of their health status. They used a large number of diagnostic tests and medical visits (GP and specialist), had at least one hospitalization in the previous year. Factors that seem to be associated with a lower probability to attend to the ED were female gender, to live in the South and Islands, to have a private paid assistance and a better perceived of health status.

Only a few studies were carried out on potentially preventable visits in Italian ED.

Barbadoro et al [21] examined non-urgent visits in a sample of young and old patients admitted to a single hospital. They found that a large part of patients suffered from chronic diseases and took medicines everyday. The authors affirm that the Italian primary care system is possibly suffering from the increasing age and comorbidity of citizens, and the increasing perception of diagnostic technologies as the sole offering an appropriate diagnosis, despite the pivotal role given to GP. Bianco et al [22] found that the odds of requiring non-urgent care were significantly higher in patients who present to the emergency department without medical referral and in patients who present with problems of longer duration. Fusco and coll. [3] emphasized the need to develop a new organizational model for delivering primary care to older patients because the ED mission is to treat urgent conditions. These Italian findings are consistent with our data, which show that those who make at least one potentially preventable admission in ED are frequent users of other health care services. A private paid assistance is a key factor in the management of older adults. Italian studies showed that about 20% of older adults, who are severely disabled, i.e. suffer from disability in basic activities of daily living, received assistance from private paid assistants [23]. Our findings are consistent with other authors, who found that having assistance at home is important to prevent hospital and ED admissions [24]. Furthermore, the lack of availability of health services is a main risk factor for the use of the ED, particularly for conditions that could be managed outside the hospital. The use of the ED is considered an indicator of a potential malfunction of the network of primary services. A study by Rust et al on 30.677 adults admitted to the ED showed that one person in three that went to the ED, had found obstacles in planning specialist visit or diagnostic test [25]. In surveys, as many as half of patients presenting at the ED for non-urgent reasons cited an inability to get a timely appointment with their healthcare provider as a reason for their visit [26, 27]. In our sample subjects who had failed to see a specialist or to do a diagnostic assessment had an increased probability to access to ED.

In agreement with international data, other risk factors for potentially preventable ED admissions in older adults are older age [28], comorbidity and polypharmacy [29]; area of

residence, in reason of the different health care organization, which includes the rate general practitioner/patients [30], and the economic resources [31]. In this respect, it should be noted that the exams and specialist consultation are free in the ED or require only a small contribution if the ED visits are deemed to be non urgent ones. On the contrary, these subjects might be requested to pay diagnostic exams and visits provided in a non urgent setting.

Many studies have also identified the perceived health status as an important factor associated with the consumption of health care resources [32]. Stevens et al found that ED users for non-clinical problems reported a low (21%) or poor perceived health status (19%) [33].

The role of female gender could have different explanations. Despite women are more disabled, they do more prevention than men as shown also in our previous study [34]. Furthermore, men suffer more often from diseases considered ambulatory care sensitive conditions, such as diabetes mellitus and chronic obstructive pulmonary disease [13].

Strengths and limitations

The main strength of our study is the evaluation of a representative sample of the Italian community-dwelling older population, based on a stratified multi-stage probability design. In addition, our data provide a description of socio-demographic characteristics of Italian older ED users. On the other hand, some limitations deserve comments: 1) not all ED visits that result in a discharge are preventable. 2) Other data, i.e. the reason why a subject referred to ED, as well as the gravity or the temporal relationship between the use ED and that of other healthcare services are unknown. 3) Emergency Department admissions and health care resources consumption are self-reported. 4) Finally, the survey collects information at different times. A potentially preventable visit could happen at any time last year, whereas some data, e.g. the variable measuring quality of life, reveal the situation of the patients at the time of the interview (and certainly they were measured after the outcome). In a cross-sectional study the exposure measure can anticipate or come after the outcome. Furthermore, it can't be excluded that some variables, such as the self-perceived health status and pharmacotherapy, changed after ED admission.

Conclusions

Our results identified several factors associated with an increased risk to experience a potentially preventable visit in emergency department. Age, area of residence, marital status and chronic conditions are non-modifiable variables that identify specific subgroups of the population who are at high risk of potentially preventable admission to the ED. On the other hand, waiting list and home assistance are modifiable factors that can be targeted by public health intervention.

Author Contributions

Conceptualization: Beatrice Gasperini, Antonio Cherubini, Emilia Prospero.

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